APPENDIX D

BIRDS

Appendix D1
Interim Report on Coastal Seabird Surveys
Islandmagee Natural Gas Storage Facility

Introduction

The following interim report presents preliminary summary data from ongoing Coastal Seabird Surveys currently being undertaken by RPS in relation to a request for further information from the Department of Environment Planning Division on the Proposed Islandmagee Natural Gas Storage Facility. These surveys are ongoing and are due to conclude in March 2012 to take in the autumn and overwintering season. Following their completion a final report presenting all data, interpretation and updated assessment (if required) of the potential impacts of the brine discharge on foraging seabirds will be drafted and submitted to NIEA NH for approval. This is envisaged to be in April 2012.

This interim report presents summary survey data collected in Spring and Summer 2011 (March-September) and should be read with reference to the proposed Islandmagee Natural Gas Storage Facility Environmental Impact Statement (EIS) and **Appendix C** and **Appendix D2**. This report also presents additional JNCC Tern Tracking Study Data from 2010 and 2011 and collates information on seabird diets and foraging distances, which will be used in the final assessment following with completion of baseline surveys.

Methodology

Survey Area

Following recommendations from NIEA NH the coastal seabird survey area extends c.2.6km from Skernaghan Point to Portmuck Bay (Figure D1). Following a number of preliminary surveys Sandwich terns were regularly noted flying into Browns Bay and subsequently foraging for long periods of time before departing for Larne Lough. Browns Bay was therefore included in the coastal survey area. All coastal waters between Skernaghan Point and Portmuck Bay and also Browns Bay to a seawards distance of 1km were surveyed for seabirds. Due to poor visibility the seawards distance was often <1km. The coastal survey area was divided into four sub-sections taking into account waters likely and unlikely to be affected by the brine discharge (EIS 9.3.4.1), geographical features and also observations of foraging birds (N. Robinson *Pers Obvs*):

- Section 1: Skernaghan Point to Castle Robin c.1km;
- Section 2: Castle Robin to McIlroys Port c. 800m;
- Section 3: McIlroys Port to Portmuck Bay c. 800m,
- Browns Bay.

The baseline salinity data obtained from AFBI and NIEA indicates that background salinities in the coastal survey area naturally range between c. 30.5psu and 34.8psu. Coastal waters likely to be affected by the brine discharge are identified as those where the salinity following brine discharge increases in excess of the waters natural range. Any salinity increase in excess of the range normally experienced in seasonal variations is expected to be restricted

to the initial mixing zone, which is an area less than 100m from the outfall point. The initial mixing zone is restricted entirely to Section 2.
Each subsection was then further divided into seawards distance bands (distances equal perpendicular distance from coastline) to facilitate counting (Figures D2 and D3):

- 0 – 100m;
- 100 – 250;
- 250 – 500m;
- 500 – 750m,
- 750m – 1km.

Coastal Seabird Survey Methodology
The aim of the surveys was to record the distribution, numbers and behaviours of seabirds within the coastal survey area taking into account seasonal, diurnal and tidal variations. Coverage of the coastal survey area was fortnightly following recommendations by NIEA NH with additional survey effort to take into account tidal and diurnal variations. Survey effort was therefore focused on two survey types:

- Early Morning & Afternoon/Early Evening Counts – undertaken fortnightly;
- High Tide/Low Tide Counts –undertaken monthly.

Early Morning & Afternoon/Early Evening Counts
These counts aimed to record any diurnal variation between the distribution of seabirds within the coastal survey area, taking into consideration known timings of peak species counts (e.g. black guillemots typically present in peak numbers in waters adjacent to colonies shortly after dawn during the breeding season) and rafting behaviours of certain species (e.g. Manx shearwater evening rafting). These counts were not restricted by tide times and therefore could be undertaken on a fortnightly basis in-so far as reasonably practical taking into consideration weather and survey conditions.
On these count days cumulative hourly counts of all seabirds within each subsection were undertaken once within the morning of the survey day and once within the afternoon/early evening of the survey day. Counts were undertaken from carefully selected vantage points to enable, which allowed complete coverage of each sub-section. During these counts all birds using the coastal survey area up to a seawards distance of 1km were recorded and their dominant behaviours noted i.e. foraging (F), loafing (L), displaying (D) and roosting (R.). Notable numbers of seabirds in excess of 1km were noted where visibility allowed, with the focus of identifying key areas for foraging terns outside of the coastal survey area. Seabirds flying over the survey were also noted.
High Tide/Low Tide Counts
Each month a single high tide and low tide count was undertaken within the coastal survey area using the methodology for morning and afternoon counts stated above. Tidal counts were restricted to being undertaken within two hours either side of high or low tide.

Background Information

Summary background information on the survey area collated from existing datasets and the EIS is presented here.

Designated Sites

Larne Lough SPA

Designated: 03/1997 (Updated 03/1998)
Size: 398ha

The Larne Lough Special Protection Area (SPA) qualifies under Article 4.1 of the Birds Directive (79/409/EEC) by regularly supporting internationally important numbers of Light-bellied Brent Geese *Branta hrota* in winter. The site also qualifies under Article 4.1 of the Birds Directive (79/409/EEC) by regularly supporting nationally important breeding populations of Annex I species Roseate Tern *Sterna dougallii* and Common Tern *Sterna hirundo*.

Larne Lough SPA covers an area of 398ha and its boundary is entirely coincident with that of the Larne Lough Area of Special Scientific Interest (ASSI) and the Larne Lough Ramsar Site. The site includes the Swan and Blue Circle Islands which support the breeding tern populations. Swan Island is managed as a National Nature Reserve (Swan Island National Nature Reserve) by RSPB and is also designated as an SPA in it's own right (Swan Island SPA, see below). Today the majority of Larne Loughs terns now breed on Blue Circle Island, an artificial island that was constructed in the 1970's using spoil form the former Magheramourne Quarry and then subsequently leased to the RSPB. In recent years Blue Circle Island has been the only island to have supported breeding Roseate Terns within Larne Lough and within Northern Ireland. Numbers of nesting pairs have however declined significantly since the 1970's (c.190 pairs) and 1990's (c. 22 pairs), with only one pair recorded in 2010. The Larne Lough tern colony as a whole has declined significantly over recent years.

Larne Lough SPA is located c.3.2km from the brine outfall point at its nearest point.

Swan Island SPA

Designated: 10/03/1992
Size: 0.1ha

Swan Island in Larne Lough qualifies as an SPA in it's own right under Article 4.1 of the Birds Directive (79/409/EEC) by regularly supporting, in summer months, nationally important breeding populations of Annex 1 species Roseate Tern *Sterna dougallii* and Common Tern *Sterna hirundo*. Small numbers of Sandwich Terns *Sterna sandicencis* and Arctic Terns *Sterna paradisaea* are also known to breed on the island.

Swan Island SPA is located c. 3.6km from the brine outfall point at its nearest location.

Larne Lough ASSI

Designated: 16/09/1996
Area: 398ha

The Larne Lough ASSI qualifies for designation by virtue of the diversity of habitats found there, ranging from artificial brackish lagoons to mudflats, rocky shores and saltmarshes. In addition to the SPA designation features of the overwintering Brent Goose population and breeding Roseate and Common Tern populations, the Larne Lough ASSI supports nationally important wintering wildfowl and wader species including Goldeneye *Bucephala clangula*, Great Crested Grebe *Podiceps cristatus*, Red-Breasted Merganser *Mergus serrator*, Shelduck *Tadorna tadorna*, Greenshank *Tringa nebularis*, Redshank *Tringa totanus*.
Larne Lough ASSI is located c.3.2km from the brine outfall point at its nearest point.

Gobbins ASSI

Designated: 31/10/2011
Area 27.59ha

The Gobbins is an area of basalt sea-cliffs on the eastern coast of Islandmagee. At the time of the Seabird 2000 survey The Gobbins cliffs held 791 pairs of Kittiwakes *Riss tridactyla* (1.6% of the all-Ireland population) and 552 Razorbills *Alca torda* (1.1% of the all-Ireland population). The site also supports the only mainland nesting Atlantic Puffins *Fratercula arctica* in Northern Ireland and significant populations of Fulmar *Fulmarus glacialis*, Cormorant *Phalacrocorax carbo*, Shag *Phalacrocorax aristotelis* and Common Guillemot *Uria aalge*. Peregrine Falcons *Falco peregrinus* also breed within the designated area.

The Gobbins ASSI is located c. 2.6km east of Larne Lough at it's nearest point and c. 2.5km from the proposed outfall location and pumping station at Castle Robin.

Portmuck ASSI

Designated: 23/03/1998
Area: 20.18ha

Portmuck ASSI on the eastern coast of Islandmagee is valued for its range of geological and geomorphological features , which extend from McIlroy's Port to the Isle of Muck. The Isle of Muck is included in the ASSI and supports notable population of breeding seabirds including Razorbill, Common Guillemot, Puffin, Kittiwake and Fulmar.

The Isle of Muck is an Ulster Wildlife Trust Nature Reserve. Annual seabird colony counts were requested for the purposes of this report and are summarised in Table D1. Nesting puffins have been largely absent from the island for a number of years Two individuals were recorded in the nearshore waters beneath the key nesting cliffs on the eastern side of the

island in June 2011 (K. Leonard *et al*., 2011) but were not thought likely to be nesting. Numbers of other nesting seabirds have fluctuated over recent count years.
Portmuck ASSI is located approximately 600m south of the proposed brine outfall location, with the Isle of Muck located approximately c. 1.5km south at its nearest point.

Table D1 Summary Isle of Muck annual seabird colony counts (2001-2011). BTO species codes are provided in Table D8.

BTO Species Code	Count Unit*	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
F.	AOS	*58*	24	32	*74*	36	43	47	62	52	51	*23*
SA	AON	2	2	3	5	4	5	9	9	10	18	15
CM	AON	0	0	1	4	4	4	4	8	15	15	-
HG	AON	*20*	18	22	28	29	25	18	23	26	44	-
LB	AON	4	11	10	10	13	9	10	8	11	13	-
GB	AON	2	2	1	1	1	0	1	1	1	2	-
KI	AON	*179*	300	*244*	227	256	239	290	168	242	213	*268*
GU	Ind	*755*	1321	*1404*	1595	1383	1125	904	746	1330	1391	*1744*
RA	Ind	*282*	746	*872*	573	415	417	244	192	295	305	*310*
TY	Ind	13	19	*12*	*13*	*6*	14	*20*	*17*	*14*	*11*	*8*
Note: Figures in italics did not follow SMP Handbook methodology regarding timing of counts *AOS – Apparently Occupied Site; AON – Apparently Occupied Nest; Ind - Individual												

Larne Lough Ramsar Site

Designated: 04/03/1997
Area: 398ha

The Larne Lough Ramsar site qualifies under Criterion 2 and 6 of the Ramsar Convention:

- 2 – By supporting an important assemblage of vulnerable and endangered Irish Red Data Book bird Species. The site regularly supports nationally important numbers of breeding populations of Roseate Tern and Common Tern;
- 6 – By supporting internationally important numbers of light-bellied Brent geese in winter.

In addition bird species occurring at levels of national importance include:

- During the breeding season – Black-headed Gull *Larus ridibundus*, Sandwich Tern, Roseate Tern, Common Tern;
- During spring and autumn – Great Crested Grebe, Common Eider and Red-breasted Merganser.
- During the winter – Cormorant, Shelduck, Goldeneye, Redshank, Greenshank and Common (Mew) Gull.

Larne Lough Ramsar Site is located c.3.2km from the brine outfall point at its nearest point.

Summary of Designated Site Ornithological Interests

Table D2 below summarises the ornithological interests for designated sites considered in this assessment. Ornithological interests from additional designated sites are discussed later in this report.

Table D2 Summary of designated site feature species

Species	Larne Lough SPA	Swan Island SPA	Larne Lough ASSI	Larne Lough Ramsar Site	Gobbins ASSI	Portmuck ASSI
Light-bellied Brent Goose	√		√	√		
Roseate Tern	√	√	√	√		
Common Tern	√	√	√	√		
Goldeneye			√	√		
Great Crested Grebe			√	√		
Red-breasted Merganser			√	√		
Shelduck			√	√		
Greenshank			√	√		
Redshank			√	√		
Black-headed Gull				√		
Sandwich Tern			√			
Eider				√		
Common Gull				√		
Kittiwake					√	
Razorbill					√	√
Puffin					√	√
Fulmar					√	√
Cormorant				√	√	
Shag					√	
Common Guillemot					√	√

Foraging Distances

Table D3 below summarises typical foraging ranges of SPA and ASSI feature seabird species during the breeding season. Foraging ranges are largely taken from the database of seabird foraging ranges being compiled by BirdLife International (BLI).

Table D3 Typical foraging ranges of SPA and ASSI feature breeding species and breeding species of the Isle of Muck.

BTO Species Code	BLI Max (km)	BLI Mean Max (km)	BLI Mean (km)	Wilson *et al*. (2009) Mean Max (km)	Ratcliffe et *al.* (2000) Max (km)
CN	37	33	9	8km	
RS	30	18	12	4km	
TE	70	42	15	8km	
AE	21	12	12	16km	
KI	200	65km	25		
RA	51	31	10		
PU	200	62km	30		
F.	664	311	69		
CA	50	32	8		
SA	20	16	7		
GU	200	61	24		
MX*	400	196	172		
TY	55	12	5		
CM					<15
GB					<50
LB	44-84km				<40
HG					<40
*AE associated with Copeland Island and Outer Ards SPAs, MX likely associated with Copeland Island SPA					

JNCC Tern Tracking Studies

The Joint Nature Conservation Committee (JNCC) in collaboration with other statutory nature conservation bodies, are currently working to identify the most suitable marine areas to be recommended as SPAs under the EC Birds Directive for breeding terns within the UK. Part of this work being undertaken is to collect data at a number of tern breeding sites to provide information on their at-sea foraging distributions during the breeding season. This data along with existing marine habitat data will be used to develop species-specific models of foraging habitat preferences. These models can then be used to predict potentially important sites in marine areas for which no at-sea foraging distribution data exists.

At-sea foraging tern distribution data has been collected from a number of sites including the Larne Lough, Copeland Island and Cockle Island tern colony sites in Northern Ireland. A request for any associated reporting was submitted to JNCC in August 2011 for the purpose of this report however, final reports for the studies are not yet available. JNCC were however able to provide some interim maps illustrating tracking and transect data from Northern Ireland tern colonies (Larne Lough, Copeland Island and Cockle Island) collected in 2009, 2010 and 2011. An unpublished interim report (Wilson *et al*., 2009) was also made available for the 2009 Proposed Islandmagee Natural Storage Facility Environmental Impact Statement (EIS) and is re-used here.

2009

The results of the JNCC 2009 fieldwork season were taken from Wilson *et al*. (2009) and should be read with Chart 5.1 and 5.2 in Section 5.4.1.2.1 of the EIS.

The 2009 JNCC fieldwork season concentrated on tern foraging locations during the chick-rearing period (June-July). Sandwich terns followed from the Larne Lough colony during the chick-rearing period showed a strong preference for fishing within or at the mouth of the Lough however, individuals were noted on occasion venturing beyond the mouth of the Lough (Wilson *et al*., 2009). Sandwich terns from the Northern Irish sites tended to stay close to shore, although often travelled large distances from their colonies but typically foraged in shallow waters of less than 10m (Wilson *et al*., 2009). In contrast common terns followed from the Larne Lough colony showed a preference for foraging at greater distances from the colony in deeper waters (30-50m) but generally within 15km of the colony. Common terns followed were shown to fish on one occasion at Skernaghan Point but the majority of individuals followed seemed to prefer foraging grounds in the vicinity of the Hunter Rock Buoys and Maidens, greater than c. 3km from the limit of significant brine influence (Wilson *et al*., 2009). No Roseate terns were tracked from the Larne Lough colony in 2009.

Foraging locations of Arctic Terns from Cockle Island and Big Copeland were not recorded within c. 8km of the limit of significant brine influence. Similar to Arctic terns common terns followed from Cockle Island tended to head in a north easterly direction but tended to remain closer to the colony (<15km) in shallower waters (30-50m). Foraging locations from Cockle Island were not recorded within c. 8km of the limit of significant brine influence.

2010

In 2010 the foraging track of one Roseate tern was recorded during the incubation period but showed no evidence of foraging within c. 5.5km of the limit of significant brine influence, with intensive foraging efforts noted c. 6.5km offshore where no impact of brine is expected (Figure D4). Foraging locations of Sandwich terns followed from Larne Lough during the chick-rearing period were again shown to be clustered within the mouth of the Lough but tracks were shown to extend beyond here with foraging locations highlighted within Browns Bay (Figure D5), where no impact of brine is expected (EIS Figures 9.22 to 9.40). Tracks were also shown to extend east of Skernaghan Point but remained further than c. 4km offshore. Tracks of Larne Lough terns during the incubation period were also shown to extend north east of Skernaghan Point towards the Maidens (D6).

In 2010 ‘snapshot’ point counts were made at a series of count points positioned in a systematic, randomly placed grid. At each count point all terns within a 300m radius of the boat were recorded. In point counts made during May 2010 (small concentrations of commic (2-5 individuals) and common terns (2-5 individuals) were recorded within c. 5km and c. 10km of the limit of significant brine influence Figure D7). Significant concentrations of commic terns (230 individuals) were recorded c. 7km from the brine outfall location, where no impact of brine is expected. Point counts were repeated in June and July but included opportunistic observations of any terns seen as the boat travelled between the count points. Similarly to May observations of terns (common and sandwich) in June and July were clustered c. 7km north and northeast of the brine outfall location and also within or at the

mouth of Larne Lough, with only a small number of terns (common and sandwich) observed within c. 2.5km of the brine outfall location (Figures D8 & D9).

2011

Some preliminary results from the JNCC 2011 fieldwork season were kindly provided by JNCC for the purposes of this report.

In 2011 the foraging tracks of sandwich terns (n=17) from Larne Lough during the chick-rearing period again highlighted the species preference for foraging within or at the mouth of Larne Lough but also within Browns Bay (Figure D10). Where birds passed out of the mouth of the Lough, foraging tracks highlighted the species tendency to stay close to the shore. Foraging tracks were noted to extend into the shallow coastal waters between Skernaghan Point and Portmuck Bay and into the limit of significant brine influence. Foraging tracks of common terns (n=30) from Larne Lough during the chick-rearing period showed the species preference to head north-east out of the mouth of the Lough towards the Hunter Rocky Buoys and Maidens. Foraging tracks of Arctic terns (n=14) from Cockle Island and Big Copeland during the chick-rearing period did not extend within c. 18km of the limit of significant brine influence.

Coastal Seabird Survey April to September 2011

Interim results and interpretation from the ongoing Coastal Seabird Surveys undertaken between March and September 2011 are summarised here. This period largely takes in the seabird breeding season and fledgling dispersal period. Only High Tide and Low Tide count data for Browns Bay have been processed at this time. Once the coastal seabird surveys are completed in March 2012 all data will be presented and more thoroughly interpreted.

Survey Conditions

Survey conditions for coastal seabird surveys completed between March and September 2011 are presented below in Tables D4 to D7.

Table D4 High Tide Count Survey Conditions

Date	Section	Start Time	Wind	Precipitation	Cloud	Visibility	Sea Conditions	Tide
31/03	1	08h10	F2-3 SE	NIL	7/8	1-3km	Large Waves	HT 08h36 0.87m
	2	09h20	F3 SE	Light - Discontinuous	7/8	1-3km	Large Waves	
	3	06h45	F2-3 SE	NIL	7/8	1-3km	Large Waves	
	Browns Bay	10h30	F2-3 SE	NIL	7/8	1-3km	Small Waves	
19/05	1	11h25	F2-3 SE	NIL	3/8	>3km	Small Waves	HT 12h10 1.13m
	2	10h10	F1 SE	NIL	4/8	1-3km	Small Waves	
	3	12h45	F2 SE	NIL	4/8	>3km	Small Waves	
	Browns Bay	09h00	F1-2 SE	NIL	5/8	>3km	Flat Calm	
15/06	1	09h30	F2 SE	NIL	3/8	1-3km	Flat Calm	HT 10h15 1.08m
	2	08h15	F2 SE	NIL	4/8	1-3km	Flat Calm	
	3	11h45	F2 SE	NIL	3/8	>3km	Flat Calm	
	Browns Bay	10h35	F2 SE	NIL	3/8	>3km	Flat Calm	
29/07	1	10h10	F2-3 SE	NIL	8/8	1-3km	Small Waves	HT 09h34 0.93m
	2	07h30	F2-3 SE	Light – Discontinuous	8/8	1-3km	Small Waves	
	3	08h50	F2-3 SE	NIL	8/8	1-3km	Small Waves	
	Browns Bay	11h15	F1-2 SE	NIL	8/8	1-3km	Flat Calm	
30/08	1	12h00	F1-2 S	Light - Discontinuous	7/8	1-3km	Flat Calm	HT 11h36 1.29m
	2	09h30	F1 S	Light - Discontinuous	7/8	1-3km	Flat Calm	
	3	10h43	F2-3 S	NIL	7/8	1-3km	Flat Calm	
	Browns Bay	08h15	F1 SE	Light - Discontinuous	7/8	1-3km	Flat Calm	

28/09	1	11h45	F2 SE	Light – Discontinuous	4/8	1-3km	Small Waves	HT 11h13 1.39m
	2	10h30	F1-2 SE	NIL	6/8	1-3km	Small Waves	
	3	09h15	F2 SE	NIL	5/8	1-3km	Small Waves	
	Browns Bay	12h55	F1-2 SE	Light - Continuous	4/8	1-3km	Flat Calm	

Table D5 Low Tide Count Survey Conditions

Date	Section	Start Time	Wind Strength	Precipitation	Cloud	Visibility	Sea Conditions	Tide
08/04	1	08h45	F1-2 SE	NIL	2/8	1-3km	Small Waves	LT 07h23 -1.10m
	2	07h30	F1-2 SE	NIL	1/8	>3km	Small Waves	
	3	06h15	F1-2 SE	NIL	1/8	>3km	Small Waves	
	Browns Bay	10h00	F1-2 SE	NIL	1/8	>3km	Flat Calm	
31/05	1	17h10	F2 S	NIL	4/8	1-3km	Small Waves	LT 15h40 -1.06m
	2	14h50	F2 S	NIL	4/8	1-3km	Small Waves	
	3	13h45	F2 S	NIL	5/8	1-3km	Small Waves	
	Browns Bay	16h00	F2 S	NIL	6/8	1-3km	Small Waves	
11/07	1	12h50	F2 S	NIL	5/8	>3km	Flat Calm	LT 13h16 -0.97m
	2	14h15	F1 S	NIL	5/8	>3km	Flat Calm	
	3	15h50	F1 S	NIL	3/8	>3km	Flat Calm	
	Browns Bay	11h45	F1 S	NIL	6/8	>3km	Flat Calm	
04/08	1	08h00	F1-2 SE	NIL	8/8	1-3km	Small Waves	LT 08h02 -1.42m
	2	06h45	F1-2 SE	NIL	7/8	1-3km	Small Waves	
	3	10h15	F1-2 SE	NIL	6/8	1-3km	Small Waves	
	Browns Bay	09h05	F2 SE	NIL	7/8	1-3km	Small Waves	
25/09	1	12h50	F1 SW	NIL	5/8	1-3km	Small Waves	LT 14h45 -1.09m
	2	14h10	F1-2 SW	Light-Discontinuous	5/8	1-3km	Small Waves	
	3	15h25	F1-2 SW	NIL	6/8	1-3km	Small Waves	
	Browns Bay	16h35	F1-2 SW	Heavy - Continuous	7/8	1-3km	Small Waves	

Table D6 Early Morning Count Survey Conditions

Date	Section	Start Time	Wind Strength	Precipitation	Cloud	Visibility	Sea Conditions
20/04	1	07h45	F2-3 S	NIL	5/8	1-3km	Small Waves
	2	09h00	F1 S	NIL	3/8	1-3km	Small Waves
	3	10h15	F1 S	NIL	4/8	1-3km	Small Waves
	Browns Bay	11h20	F1 S	NIL	4/8	1-3km	Small Waves

06/05	1	09h00	F1-2 SE	Light - Discontinuous	6/8	1-3km	Small Waves
	2	07h45	F1 SE	NIL	4/8	1-3km	Small Waves
	3	06h30	F2 SE	Light – Discontinuous	6/8	1-3km	Small Waves
	Browns Bay	10h15	F1 SE	Light - Continuous	6/8	1-3km	Flat Calm
18/05	1	10h20	F2 S	NIL	7/8	1-3km	Small Waves
	2	07h50	F2 S	NIL	5/8	1-3km	Small Waves
	3	06h45	F2-3 SE	NIL	7/8	1-3km	Small Waves
	Browns Bay	09h05	F2 S	NIL	7/8	1-3km	Small Waves
02/06	1	09h50	F2 SW	NIL	8/8	>3km	Small Waves
	2	07h35	F0-1 SW	NIL	7/8	>3km	Small Waves
	3	06h15	F2 SW	NIL	8/8	>3km	Small Waves
	Browns Bay	08h40	F2 SW	NIL	8/8	>3km	Flat Calm
16/06	1	07h50	F1-2	NIL	6/8	1-3km	Flat Calm
	2	10h15	F2 S	NIL	4/8	1-3km	Flat Calm
	3	06h30	F1-2	Light - Continuous	6/8	1-3km	Flat Calm
	Browns Bay	08h55	F1-2	Light - Discontinuous	6/8	1-3km	Flat Calm
01/07	1	06h45	F1 S	NIL	7/7	1-3km	Flat Calm
	2	08h00	F1 S	NIL	7/8	1-3km	Flat Calm
	3	09h20	F1-2 S	NIL	6/8	>3km	Flat Calm
	Browns Bay	10h45	F1 S	NIL	5/8	>3km	Flat Calm
15/07	1	09h10	F1 S	NIL	7/8	1-3km	Flat Calm
	2	07h25	F1 S	NIL	7/8	>3km	Flat Calm
	3	07h45	F1 S	NIL	7/8	1-3km	Flat Calm
	Browns Bay	11h00	F1 S	NIL			Flat Calm
27/07	1	09h00	F2 S	NIL	1/8	1-3km	Flat Calm
	2	06h30	F1 S	NIL	2/8	>3km	Flat Calm
	3	07h45	F1 S	NIL	1/8	1-3km	Flat Calm
	Browns Bay	10h05	F2 S	NIL	1/8	>3km	Flat Calm
11/08	1	09h10	F2 SE	Light - Discontinuous	8/8	1-3km	Small Waves
	2	06h30	F1-2 SE	Light - Discontinuous	8/8	<1km	Small Waves
	3	07h45	F2 SE	Light - Discontinuous	7/8	<1km	Small Waves
	Browns Bay	10h20	F2-3E	Light - Discontinuous	6/8	1-3km	Small Waves
26/08	1	09h30	F2 S	Light - Continuous	8/8	<1km	Flat Calm
	2	06h45	F2 S	NIL	7/8	1-3km	Flat Calm
	3	08h00	F1 E	Light - Discontinuous	8/8	1-3km	Flat Calm
	Browns Bay	10h45	F1-2 S	NIL	8/8	1-3km	Flat Calm

08/09	1	06h30	F2-3 N	NIL	4/8	>3km	Small Waves
	2	07h45	F2-3 N	NIL	4/8	>3km	Small Waves
	3	09h05	F2-3 NW	NIL	4/8	>3km	Small Waves
	Browns Bay	10h25	F2-3 NW	NIL	4/8	>3km	Flat Calm
29/09	1	09h45	F2-3 (Variable)	NIL	5/8	1-3km	Small Waves
	2	07h00	F1-2 (Variable)	NIL	7/8	1-3km	Small Waves
	3	08h20	F1-2 (Variable)	NIL	7/8	1-3km	Flat Calm
	Browns Bay	10h50	F1-2 (Variable)	Light - Continuous	5/8	1-3km	Flat Calm

Table D7 Afternoon/Early Evening Count Survey Conditions

Date	Section	Start Time	Precipitation	Cloud	Visibility	Sea Conditions
20/04	1	13h00	NIL	4/8	>3km	Small Waves
	2	14h10	NIL	4/8	>3km	Small Waves
	3	16h25	NIL	4/8	1-3km	Small Waves
	Browns Bay	15h20	NIL	4/8	>km	Flat Calm
06/05	1	15h55	NIL	3/8	>3km	Flat Calm
	2	14h40	NIL	3/8	>3km	Flat Calm
	3	13h10	NIL	4/8	>3km	Flat Calm
	Browns Bay	17h00	NIL	4/8	>3km	Flat Calm
18/05	1	12h55	NIL	7/8	1-3km	Small Waves
	2	14h10	NIL	6/8	1-3km	Small Waves
	3	15h25	NIL	8/8	1-3km	Small Waves
	Browns Bay	16h30	Heavy - Continuous	8/8	<1km	Small Waves
02/06	1	14h10	NIL	8/8	>3km	Small Waves
	2	13h00	NIL	7/8	>3km	Small Waves
	3	15h20	NIL	5/8	>3km	Small Waves
	Browns Bay	16h25	NIL	5/8	>3km	Flat Calm
16/06	1	13h00	NIL	6/8	1-3km	Flat Calm
	2	14h10	NIL	4/8	1-3km	Flat Calm
	3	16h25	Light - Continuous	6/8	1-3km	Flat Calm
	Browns Bay	15h20	Light - Discontinuous	6/8	1-3km	Flat Calm

01/07	1	13h00	NIL	7/7	1-3km	Small Waves
	2	14h20	NIL	7/8	1-3km	Small Waves
	3	16h45	NIL	6/8	>3km	Small Waves
	Browns Bay	15h35	NIL	5/8	>3km	Small Waves
15/07	1	13h00	NIL	6/8	>3km	Flat Calm
	2	15h20	NIL	6/8	>3km	Flat Calm
	3	14h05	NIL	7/8	>3km	Flat Calm
	Browns Bay	16h30	NIL	7/8	>3km	Flat Calm
27/07	1	16h30	NIL	1/8	>3km	Small Waves
	2	13h00	Light - Continuous	2/8	>3km	Small Waves
	3	14h15	Light - Continuous	1/8	>3km	Small Waves
	Browns Bay	15h25	NIL	1/8	>3km	Flat Calm
11/08	1	14h20	Light - Discontinuous	8/8	1-3km	Small Waves
	2	16h35	Light - Discontinuous	8/8	1-3km	Small Waves
	3	13h00	Light - Discontinuous	8/8	1-3km	Small Waves
	Browns Bay	15h25	Light - Discontinuous	8/8	1-3km	Small Waves
26/08	1	13h00	Light - Discontinuous	7/8	1-3km	Flat Calm
	2	14h15	Light - Discontinuous	7/8	1-3km	Flat Calm
	3	16h30	Light - Discontinuous	7/8	1-3km	Flat Calm
	Browns Bay	15h25	Light - Discontinuous	7/8	1-3km	Flat Calm
08/09	1	15h30	NIL	2/8	>3km	Small Waves
	2	14h15	NIL	2/8	>3km	Small Waves
	3	13h00	NIL	2/8	>3km	Small Waves
	Browns Bay	16h35	NIL	2/8	>3km	Flat Calm
29/09	1	13h00	NIL	6/8	>3km	Small Waves
	2	14h15	NIL	6/8	>3km	Small Waves
	3	15h30	NIL	6/8	>3km	Flat Calm
	Browns Bay	16h40	NIL	6/8	>3km	Flat Calm

Peak Counts (March – September 2011)

Table D8 presents peak counts per subsection for the Coastal Seabird Survey collected between March and September 2011. Raw datasets are available to NIEA NH upon request but will be submitted electronically with the final report.

Table D8 Peak Coastal Seabird Survey Counts March – September 2011

Species	Peak count				Conservation Status**
	Section 1	Section 2	Section 3	Browns Bay*	
(AC) Arctic Skua *Stercorarius prasiticus*	1	0	2	**0**	NI
(BH) Black-headed Gull *Larus ridibundus*	9	6	20	25	Red BOCCI, NI
(CA) Cormorant *Phalacrocorax carbo*	5	2	4	3	Amber BOCCI
(CM) Common Gull *Larus canus*	7	11	29	59	Amber BOCCI
(CN) Common Tern *Sterna hirundo*	12	4	8	32	Annex 1, WO, Amber BOCCI
(CU) Curlew *Numenius arquata*	0	0	1	0	WO, Red BOCCI, NI
(EI) Eider *Somateria mollissima*	4	9	8	2	Amber BOCCI
(F.) Fulmar *Fulmarus glacialis*	3	1	5	0	
(GB) Great Black-backed Gull *Larus marinus*	2	2	2	2	Amber BOCCI
(GU) Common Guillemot *Uria aalge*	11	8	31	**2**	Amber BOCCI
(GX) Gannet *Morus bassanus*	10	9	4	**1**	Amber BOCCI
(H.) Grey Heron *Ardea cinerea*	1	1	3	**1**	WO
(HG) Herring Gull *Larus argentatus*	8	3	8	3	Red BOCCI, NI
(KI) Kittiwake *Rissa tridactyla*	7	20	19	0	Amber BOCCI
(LB) Lesser Black-backed Gull *Larus fuscus*	1	0	1	**1**	Amber BOCCI
(MA) Mallard *Anas platyrhnchos*	0	2	5	5	
(MS) Mute Swan *Cygnus olor*	0	1	0	0	Amber BOCCI
(MX) Manx Shearwater *Puffinus puffinus*	3	2	3	0	WO, Amber BOCCI
(ND) Great Northern Diver *Gavia immer*	1	2	1	0	Annex 1
(OC) Oystercatcher *Haematopus ostralegus*	3	2	7	9	Amber BOCCI

(PU) Puffin *Fratercula artica*	0	0	1	0	WO, Amber BOCCI
(RA) Razorbill *Alca torda*	12	14	31	3	Amber BOCCI
(RH) Red-throated Diver *Gaviastellata*	1	1	8	0	Annex 1, WO, Amber BOCCI
(RK) Redshank *Tringa tetanus*	0	0	2	0	WO, Red BOCCI, NI
(RM) Red-breasted Merganser *Mergus serrator*	2	2	0	0	
(RP) Ringed Plover *Charadrius hiaticula*	0	0	4	0	Amber BOCCI
(SA) Shag *Phalcrocorax aristotelis*	46	30	13	0	Amber BOCCI
(SU) Shelduck *Tadorna tadorna*	0	4	2	0	Amber BOCCI
(TE) Sandwich Tern *Sterna sandvicensis*	4	16	28	0	Annex 1, WO, Amber BOCCI
(TT) Turnstone *Arenaria interpres*	8	2	11	0	
(TY) Black Guillemot *Cepphus grylle*	7	12	42	0	Amber BOCCI

*Peak from High Tide and Low Tide Count Data only.
** Annex 1 – EC Birds Directive Annex I Species; WO – Protected under the Wildlife (NI) Order 1985 as amended; Red BOCCI – Red-listed Bird of Conservation Concern in Ireland. Amber – Amber-listed BOCCI; NI – Northern Ireland Priority Species

Key Species Accounts

The following species are of key interest because they are listed as a feature breeding species of Larne SPA, Portmuck ASSI (Isle of Muck) or Gobbins ASSI during, or they are red-listed BOCCI, are an EU Birds Directive Annex I species, or are feature species of nearby SPAs in the breeding season.

Roseate Tern (BTO Species Code RS)

Roseate Terns *Sterna dougallii* have been largely absent from the Larne Lough tern colony in recent years (Table D.1) and were not recorded during RPS Open Coast Waterbirds Survey in Summer 2009 (EIS 5.3.7.4). Similarly Roseate Terns were not recorded during RPS Coastal Seabird Surveys in 2011. In 2010 one pair of territorial Roseate Terns was recorded in Larne Lough and the foraging track of a single individual during the incubation stage was subsequently recorded during JNCC Tracking Studies.

Roseate Terns have been shown to have a more restricted and less diverse diet than other terns feeding almost exclusively on small schooling fish species. In Europe Roseate Terns have primarily been noted to take sandeels *Ammodytes marinus*, *A. tobianus*, herring *Clupea harengus* and sprat *C. sprattus* . Studies from the Rockabill colony off the Skerries in north Dublin between 1997and 1999 show sandeels were the most common prey species

presented by roseate terns during the courtship and incubation stage (Newton & Crowe, 2000). Clupeids (e.g. sprat and herring), gadoids (e.g. pollack *Pollachius pollachius*, saithe *P. virens* and Rockling spp) and 'other prey' (squid and crustaceans) were also presented to a much lesser extent, with clupeids more frequently presented in years when the number of sandeels presented decreased (Newton & Crowe, 2000). During the chick provisioning stage at Rockabill clupeids became the predominant prey species presented to Roseate Tern chicks between 1997 and 1999 with lesser amounts of clupeids and significantly lesser amounts of gadoids (Newton & Crowe, 2000).

Roseate Terns typically forage within 15km of their colony however, will forage beyond this range in association with the presence of shallow sandbanks. At Rockabill Roseate Terns were found to forage within 10km of the colony with some birds foraging up to 30km away (Newton & Crowe, 2000). Similar studies from Lady's Island Lake found Roseate Terns most frequently foraged within 5km of the colony (Newton & Crowe, 2000). In 2009 birds tracked from Coquet Island, Northumberland typically foraged within 8m of the colony, with their foraging locations largely restricted to 30m water depth (Wilson *et al*., 2009).

Sandwich Tern

Sandwich terns similar to Roseate terns (although to a lesser extent) are specialised foragers, feeding almost exclusively on clupeids and sandeels (Wilson *et al*., 2009) with smaller amounts of gadoids (e.g. pollack, whiting *Gadus merlangus* and cod *G. morhua*) taken. Average foraging distances for Sandwich terns listed in the literature include 13.1km and 16km although they are known to travel huge distances from their colonies (Allcorn *et* al., 2003; Wilson *et al*., 2009). Recent survey work has shown that Common and Sandwich terns forage beyond 15km from their colonies however, foraging is generally concentrated within 5km of their colonies (Allcorn *et al*., 2003).

Sandwich terns notably tend to forage close to shore in shallow waters (less than 30m water depth). In 2009 and 2011 JNCC tracking studies showed birds tended to forage largely within, or at the mouth of Larne Lough however a number of individuals did venture beyond the Lough but staying relatively close to the coastline.

Foraging Sandwich terns were largely concentrated in Browns Bay, Portmuck Bay and in the shallow waters surrounding Skernaghan Point. They tended to fish sporadically throughout the remainder of the survey area but usually within 500m of the coastline.

Common Tern

Similar to Sandwich terns foraging Common terns were largely concentrated in Browns Bay, Skernaghan Point, Portmuck Bay and more sporadically and further offshore throughout the rest of the survey area. Where visibility conditions permitted notable flocks of "commic" terns could be seen foraging with gulls and kittiwakes north of the Hunter Rock Buoys.

Common Terns are generalist or opportunistic feeders, having been found to switch rapidly between prey types as circumstances change e.g. tidal and weather conditions or time of day (Chivers, 2007; Wheatland Palmer, 2011). Diets can vary considerably between colonies and depends largely on available feeding habitats and local prey abundances. Typical marine fish in the diet consistently include herring, sprat (clupeids), sandeels (*Ammodytes*

marinus and *A. tobianus*). Clupeids are the main prey type delivered to common tern chicks at the Belfast Harbour RSPB Reserve, along with shore crabs *Carcinus maenas* and Common Shrimps *Crangon vulgaris* frequently presented during low tide conditions and sandeels gadoids and Sticklebacks *Gasterosteus aculeatus* (Chivers, 2007; Wheatland Palmer, 2011). Flatfish have also been noted being presented to Belfast Harbour and Larne Lough chicks but are most often rejected due to the inability of chicks to swallow such species (Chivers, 2007; M. Tickner RSPB *Pers Comms*). The size of clupeids delivered to chicks has been found to vary during the breeding season, but generally fish of 4-7cm are presented, with smaller specimens typically presented to younger chicks.
Common Terns typically forage 3-10km from breeding colonies however, often up to 22km or 37km Common Terns from the Belfast Harbour RSPB Reserve generally forage within 8km of the colony.

Arctic Tern
Arctic terns *Sterna paradisaea* were not recorded within the coastal survey area during 2011 coastal seabird surveys. JNCC tracking studies of Arctic Terns from Cockle Island and Big Copeland between 2009 and 2011 did not show the species to fish with c.8km of the limit of significant brine influence.

Sandeels make up a significant proportion of the Arctic tern diet along with sprat and herring (clupeids). Adults typically forage within 5km of the colony but further foraging distances are associated with the presence of sandbanks as with other tern species.

Summary of Potential Impacts of Brine Emissions on Foraging Larne Lough SPA Tern Species

This section should be read with reference to **Appendix C**.

For the purposes of this assessment the impact on foraging terns associated with the Larne Lough and Swan Island SPAs and to a lesser degree the Copeland Island and Outer Ards SPAs (Arctic Terns), is based on the potential impacts on typical key prey species (namely sandeels, clupeids and gadoids) and loss of foraging potential within key foraging areas identified by JNCC Tern Tracking Study data (2009-2011) and 2011 RPS Coastal Seabird Surveys.

The brine outfall location is located approximately 450m off the eastern coast of Islandmagee, at a depth of 27m. The modelling outputs of the salinity as detailed in Section 9.3.4.1 of the EIS predict increases in excess of the range normally experienced salinities at this locale (which are) to be restricted to the initial mixing zone, less than 100m from the outfall. This corresponds to a distance of c. 350-550m from the eastern Islandmagee coastline. At this location no significant foraging by tern species was recorded during 2011 coastal seabird surveys or by JNCC Tern Tracking Study data. Regular foraging areas for terns from the Larne Lough colony as identified by JNCC Tern Tracking Study data are within or at the mouth of Larne Lough, Browns Bay and an area far north of Skernaghan Point towards the Hunter Rock Buoys and Maidens, where no increased salinity as a result of the brine discharge is expected. Foraging terns were observed to a significantly lesser extend by

both JNCC Tern Tracking studies and RPS 2011 Costal Seabird Surveys within the nearshore (upto 1km) coastal waters between Skernaghan's Point and Portmuck Bay. Foraging terns were subsequently rarely observed foraging within the limit of significant brine influence and localised foraging within these coastal waters was concentrated within a few meters of Skernaghan Point and Portmuck Bay, where no significant increase in salinity as a result of the brine discharge is expected.

Sandeels are a consistent dietary component of all Northern Ireland terns to a varying degree. In a study on the lesser sandeel *A. marinus* in Shetland the species like other sandeel species was shown to have a preference for sandy sediments, in particular coarse sand areas (<2mm particle size) with strong currents, typical of a rippled bottom and with a silt content of less than 2%. The species was also found to be largely absent from sediment with a silt content >10%. The areas around the brine outfall location are dominated by coarse sediments, much coarser than those preferred by sandeels. The closest concentration of sandy sediments is within the shallow waters of Portmuck Bay, c. 1.3km from the limit of significant brine influence and subject to only marginal increases in salinity, which are well within demonstrated salinity tolerances of sandeel species (e.g. *A. marinus* 34.76-35.18psu). Although pockets of sandeels can't be ruled out from the initial mixing zone (<100m from the outfall) and near field (100-200m from the outfall), important concentrations of sandeels are unlikely to occur in the near vicinity (c.20m diameter) of the brine outfall location likely to experience salinities in excess of 36.6psu, due to the presence of coarse sediments. Sandeels may forage over the wider coastal area but typically tend to forage over the sediments they inhabit. There is likely to be a degree of avoidance by sandeels of the immediate area of the brine outfall location (c. 20m diameter) however, this would only constitute a minor negative impact on the species considering that a relatively small population are likely to be involved.

The fry of clupeid species (e.g. herring) are also a consistent dietary component of all Northern Ireland terns to a varying degree. The increased salinities associated with the Islandmagee brine discharge within 100-200m around the outfall (36-38psu) are relatively minor compared to the upper salinity ranges for clupeid larvae (e.g. herring). In addition fish eggs and larvae are controlled by the movement of the general waterbody and can be carried extensive distances from their spawning grounds. It is therefore unlikely that any given group of fish eggs and larvae are going to be present in waters of significantly elevated salinity (i.e within 10m) for any extended period of time. The risk of adverse impacts on these sensitive life stages of local fish populations is unlikely to be significant. The risk of decreases in subsequent life stages of such populations in the wider Irish Sea and thus limiting the availability of small clupeid and gadoid species to Larne Lough terns within their typical foraging ranges species, is therefore unlikely to be significant.

In light of additional information regarding the potential impacts on tern prey species based along with additional ornithological survey data, RPS withhold the original assessment made in the Islandmagee Storage EIS in that no significant impact as a result of brine emissions are predicted on tern species associated with Larne Lough and Swan Island SPA, as a result of the brine discharge leading to loss of foraging potential. The reduction in fish prey species by avoidance of areas of increased salinity is likely to be localised to within the limit of

significant brine influence (<100m from the outfall), not recorded as a key foraging location of terns and breeding seabirds associated with adjacent ASSIs. This is also unlikely to be significant in terms of extensive tern foraging ranges detailed above. Following the granting of permission to drill the deposits and obtain salt cores for detailed chemical analysis this assessment can be re-visited if required.

Great Black-backed Gull
Great black-backed gulls are formidable predators, scavengers and food pirates. They are opportunistic and their diet can change significantly with locality and season and during the breeding season and can often reflect seabird colonies adjacent to their nesting locations. Small mammals (rabbits, mice, rats), birds (adults, eggs and nestlings), fish, crustaceans and carrion are key prey items.

Herring Gull
Takes a wide range of prey items including fish, small birds and mammals, eggs, crustaceans and intertidal invertebrates. Starfish were commonly recorded as prey items for gulls foraging in Browns Bay and Portmuck Bay. Scavenge over farmland, harbours, urban areas and refuse tips.

Lesser Black-backed Gull
Opportunistic but to a lesser degree than other gulls, scavenging and food piracy also to a lesser degree than other gulls. More open-sea feeding than other gulls. Generally piscivorous but will take a range of vertebrates, invertebrates and waste materials. Typical fish species taken include gadoids, cluepeids (herring) and sandeels, when present in surface shoaling schools. Crabs, shrimps, worms, molluscs and starfish also taken along with plant material, seaweed agricultural grains and berries where available. Small mammals and birds (usually nestlings) taken, often from immediate nesting colonies.

Common Gull
Similarly to black-headed gulls common gulls are largely opportunistic and few studies have attempted to quantify seasonal diets. Broadly their diets consist of earthworms, aquatic and terrestrial invertebrates, small fish. Regurgitates from chicks on the Copeland Island have included terrestrial worms and marine arthropods (S. Wolsey, QUB *Pers Comms*). Common gulls will also frequent agricultural lands, re-fuse tips, parks and harbours to scavenge a variety of items.

Black-headed Gull
Gull species are rarely specialist foragers and are largely opportunistic. Black-headed gulls forage on a range of items throughout the year and over a range of habitats. Their diet can largely consist of aquatic and terrestrial insects, marine invertebrates obtained from intertidal sand/mud flats, earthworms and offal. They also frequently forage over agricultural land feeding on crop waste and grain and also over refuse tips, parks and gardens. Sewage outfalls also provide important foraging habitats.

Foraging ranges have been poorly researched but can range between 5-15km during the breeding season (Brandl & Gorke, 1988).

Shag

The European Shag is largely an opportunistic feeder taking a range of benthic, dermersal and pelagic fish species, with sandeels (lesser sandeel *Ammodytes marinus)* being a dominant prey species taken by British populations. Breeding success has been shown to be low in years of poor sandeel abundance. Benthic fish species are taken to a lesser extent than Cormorants. Sandeels are consistently reported as a key component of the diets of Isle of Muck birds comprising 28.3-91.5% (by mass) of the diet between 2007 and 2010. The remainder of the shag diet mainly comprises of gadoids, clupeids, sea scorpions *Taurulus bubalis* and butterfish *Pholis gunnellus*.

Mean foraging ranges of the Isle of Muck colonies during the chick rearing period were found to be 7km from the colony, with birds utilising waters close to the colony (<2km) and more distance waters (5-13km). Their distribution was strongly related to water depth and sea-bottom sediment type, with shags feeding most often in waters 20-40m deep with a gravel, sandy or rocky bottom.

Shags were frequent foragers within the survey area usually within 250m of the coastline in shallower waters. Browns Bay (unreported survey data) and Portmuck Bay consistently held foraging shags, likely due to the shallow sandy waters supporting preferred prey items.

Cormorant

Peak numbers recorded roosting at Skernaghan Point (Section 1) with lesser numbers foraging and loafing throughout the survey area. In marine environments cormorants feed predominantly on bottom-dwelling fish and crustaceans including flatfish, blennies, sea scorpions, sculpins and gadoids, obtained by surface diving. Cormorants will also take schooling fish such as sandeels demonstrating their ability to switch readily between benthic and pelagic species. Dab, plaice and flounder are frequent species. Eels and salmonids also feature in the diet to some extent in Northern Ireland during summer months.

Comorants are typically solitary feeders and can forage up to 20-25km from their breeding colonies or wintering roost sites. Feeding-flocks do occur and are generally associated with schooling prey. Cormorants can dive to depths of c.30m but generally forage up to depths of 12m to obtain benthic prey species. Schooling prey are often taken in deeper waters.

Northern Gannet

Generally forage in large communal flocks over shoals of fish but will forage singly. Often associated with sandbanks and areas of tidal mixing and over spawning grounds of favoured prey species such as herring. Foraging distributions are also influenced by traditional commercial fishing grounds, particularly in the North Sea, with major gannet feeding areas concentrated around commercial herring, mackerel and sandeel fisheries.

The Northern Gannet is largely opportunistic feeding on a wide range of surface schooling fish and squid. Gannets readily switch between abundant prey items and their overall diet is subject to significant geographic, annual and seasonal variation. They are also a dominant scavenger at discarding trawlers. Gannets generally choose larger more energy rich species

with mackerel a consistent prey species taken by the UK breeding population along with herring, sandeels, haddock, sprat, whiting, other gadoid and clupeid species. Their broad diet and ability to switch between prey items would suggest they have a significant ability to buffer against localised reductions in food supplies.

Northern Fulmar

Fulmars are primarily surface feeders obtaining most of their prey through surface seizing whilst floating. Fulmars feed on a wide range of foods being largely opportunistic and known for scavenging offal discarded from trawlers, particularly in the North Sea (Camphuysen & Garthe, 1997). They feed on a variety of fish (including sandeels, sprat and small gadoids), zooplankton (amphipods and copepods), jellyfish and squid. Although surface feeding mesopelagic species of fish, squid and crustaceans are also frequent in the diet, suggesting night time feeding when such species are available in the surface waters.

Fulmars commute regularly over large foraging distances often to regular foraging habitats along continental shelf edges. Adult foraging trip lengths during the breeding season can often be a number of days, with birds from UK colonies frequenting the North Sea and Irish Seas. Individuals satellite tagged from a Greenland colony showed adults to forage 40-200km during incubation and chick-rearing stages. Most foraging during the chick-rearing stage is thought to be within 100km of the colony.

Fulmars were not observed foraging within the survey area but small numbers likely associated with the colonies at Portmuck and Isle of Muck were recorded loafing. Individuals were regularly observed commuting in a northeasterly or south westerly direction. Observations made on nesting pairs at Portmuck Bay showed a tendency in the adults birds to depart their nests and fly east, out to sea. Adults were noted at nesting sites in Portmuck Bay until mid-June, early July and it is presumed all nesting attempts here failed.

Kittiwake

Around the British Isle Kittiwakes feed predominantly on small surface shoaling fish such as sandeels, sprats and young herring (cluepeids and gadoids) but will also associate with offal discarded from fishing vessels. Typical foraging ranges for birds from UK colonies can be upwards of 20km away but are generally associated with areas regularly supporting an abundance of surface shoaling prey such as sandbanks.

Manx Shearwater

The nearest Manx shearwater colony to the brine outfall location is located on the Copeland Islands, c. 25km south of the outfall. The Copeland Islands Manx Shearwaters are a feature of the Copeland Island SPA whereby the Copeland Islands SPA qualifies for designation under Article 4.1 of the EC Birds Directive (79/409/EEC) by supporting nationally important breeding populations of arctic tern and under Article 4.2 by supporting internationally important breeding populations of Manx shearwater.

Manx shearwaters feed largely on small schooling ‘bait’ fish such as herring and spratt. Small crustaceans, squid and offal are also reported.

GPS tracking studies have shown Manx shearwaters have extensive foraging distances it is possible that a proportion of birds frequenting Irish waters may also be associated with the Stockholm and Skomer (south-west Wales), Rum (south-west Skye) Glannau Aberdaron and Ynys Enlli/Aberdaron Coast and Bardsey Island SPA populations (north-west Wales).

Seawards extensions are currently being proposed for a number of UK SPAs to include marine areas on which existing qualifying features are ecologically dependent. Currently such areas identified for Manx shearwaters include those where aggregations of evening rafting adult birds are regularly formed prior to them coming ashore to feed their chicks after night-fall. Investigative studies using GPS tracking have been used to identify such rafting areas used by the populations of the Skomer, Rhum and Bardsey SPAs. Seawards boundary extensions for these SPAs have been recommended as 4km for Skomer and Stokholm SPA, 6km for Rum SPA and 9km for Bardsey Island part of the Glannau Aberdaron and Yns Enlli/Aberdaron Coast and Bardsey Island SPA. An extension of at least 4km (or more) for other SPAs for which Manx shearwater is a designated feature has been recommended.

The Copeland Island SPA has been highlighted by JNCC as one that may be extended. RPS are aware that investigative studies into the identification of important rafting areas of the Copeland Island SPA Manx shearwater population are currently being completed. Interim data is however not available and remains sensitive until finalised. In correspondence with NIEA RPS have however been assured that no significant usage of the sea area off Portmuck by rafting Manx Shearwater associated with the Copeland Islands SPA has been identified (I. Enlander NIEA *Pers Comms*).

Rafting behaviour was not recorded within the coastal survey area during PM surveys undertaken by RPS in 2011.Manx shearwaters were recorded almost exclusively flying over the survey area at distances >750m offshore. Foraging behaviour was noted on only a few occasions within the survey area and on occasion but largely passed the Hunter Rock Buoys c.2km from the shore. Only a small number of loafing individuals were noted within the survey area.

Common Guillemot

Common guillemots take mostly pelagic schooling fish, predominantly sandeels, mackerel, herring and sprat. Gadoids and crustaceans also taken.

Razorbill

During the breeding season Razorbills are generally known to feed well away from their colonies in shallow waters over sandy sea beds (Wanless *et* al., 1990). Foraging ranges usually fall between15-20km with most prey caught within 15km of a colony however, regular concentrations of feeding Razorbills have been recorded at distances of between 9-13k and 26-28 away from their colonies. Foraging razorbills are also associated with areas of upwellings and tidal fronts, where fish are brought to the surface by flow gradients.

Sandeels and to a lesser extent clupeids (sprat and herring) caught by surface-diving represent the key component of the Razorbills diet. In European colonies during the breeding

season, adult and chick diet is almost exclusively sandeels. Between 2007 and 2009 chicks from the Isle of May colonies were fed almost exclusively on 0-group sandeels, however in 2010 chicks were fed predominantly on clupeids (67% of adult food loads). A study into the diets of auks from the Rathlin Island colony over three years show Razorbills took predominantly sandeels and then clupeids up to about a maximum of 9 cm long (L. Chivers QUB *Pers Comms*).

Puffin

Atlantic Puffins feed largely on small to mid-sized fish (5-15cm) obtained by pursuit surface diving. Sandeels comprise a large proportion of the diets of Scottish populations with other prey items taken by UK birds including sprat, whiting, saithe, haddock, herring and rockling. At the Isle of May colony between 2007 and 2010 63-91% of prey items brought to chicks by adults consisted of 0-group sandeels. Puffins are known to switch readily between prey species when preferred prey species are limited. Puffins typically feed close (3-5km) to their breeding colonies in shallow waters however are often recorded at greater distances of 10km and as far as 40-100km. Greater foraging distances appear to be associated with the occurrence of shallow sandbanks and tidal fronts.

Black Guillemot

Black Guillemots feed on and provision their chicks primarily with benthic fish species, most notably butterfish. They forage largely in shallow inshore waters with rocky seabeds often vegetated with kelp during the breeding season, which reflects the typical habitat of butterfish. Breeding pairs from the Copeland Island and Bangor, Northern Ireland are reported to feed almost exclusively on Butterfish (K. Leonard *Pers Comms*). Additional prey species taken by Scottish populations include sandeels and gadoids along with flat fish and sea scorpions. During the winter Black Guillemots usually remain close to their nesting colonies, although fledged young tend to disperse over large distances. Many adults also disperse to moult before returning over the course of the winter months. Few studies have examined the wintering diet of Black Guillemots but it is likely that butterfish remain a key component throughout the year. During the breeding season Black Guillemots tend to forage within 5km of their colonies and often up to 10km. Exceptional foraging distances have been noted up to 55km.

In 2009 an Open Coast Breeding Seabird Survey was undertaken to locate breeding seabirds within c. 400m of the brine outfall location. No breeding seabirds were located within 400m of the outfall location in 2009. In 2011 it was not the intention to repeat the Open Coast Breeding Seabird Survey, instead the purpose of the surveys was to identify the use of coastal waters by foraging seabirds. Subsequently two black guillemot nests were recorded just north of the proposed outfall location (Figure D11). A maximum of 6 birds were noted to regularly associate with this small colony and closer inspection of the site confirmed two nests. The construction of the outfall location and pumping station will not directly result in the loss of potential nest sites however construction works will cause significant disturbance to nesting pairs if carried out during the breeding season. The nesting sites are located c.100m from the proposed pumping station and c.200m from the outfall pipe. Mitigation regarding timing of works at this locale is therefore proposed due to potential of disturbance to nesting birds.

Mitigation

Article 4 of Part II of the Wildlife (Northern Ireland) Order 1985 as updated by the Wildlife and Natural Environment Act (Northern Ireland) 2010 states that —

1) Subject to the provisions of this Part, if any person intentionally or recklessly—

(a) kills, injures or takes any wild bird; or
(b) takes, damages or destroys the nest of any wild bird while that nest is in use or being built; or
(ba) at any other time takes, damages or destroys the nest of any wild bird included in Schedule A1; or
(bb) obstructs or prevents any wild bird from using its nest; or
(c) takes or destroys an egg of any wild bird,

he shall be guilty of an offence.

If it is determined that blasting is required at the site of the pumping station at Castle Robin a detailed methodology will be prepared and submitted with the EMP for approval by the NIEA. To comply with statutory legislation construction works at Castle Robin Bay should be undertaken outside of the breeding bird season. The breeding bird season is not defined in Northern Ireland legislation but is broadly acknowledged as March to August. September has been highlighted as an appropriate month during which to carry out any required blasting.
Habitat Enhancement

The local importance of this black guillemot colony is high due to its proximity to breeding populations associated with Portmuck ASSI, but also due to the history of decline of nesting pairs within Larne Lough. The provision of additional artificial nesting sites through the provision of nesting tunnels may help expand this colony.

Great Northern Diver
The diet of the great northern diver largely depends on season and locality but primarily feeds on fish, crustaceans and molluscs. Aquatic worms, insects and amphibians also taken. Key fish species taken include haddock, herring, sprat, sandeel and also benthic flat fish. Crustaceans largely include crabs and shrimps.

Ongoing coastal seabird surveys will conclude in March 2012 and therefore taken in the overwintering months when Great Northern Divers are most numerous in Northern Irish waters.

Red-throated Diver
Overwintering red-throated divers typically start to arrive in Irish waters from their arctic breeding areas in September, with numbers tending to peak in January and February. Red-throated divers are generally associated with shallow sandy bays and inshore waters when wintering in Britain and Ireland (Okill, 1994), but can occur much greater distances offshore

where shallow sandbanks occur. Belfast Lough is a notable overwintering site for the species in Northern Ireland.

In the UK red-throated divers commonly take herring, sprat and sandeel and although few studies have described the species wintering diet, cod is a consistent item taken by birds wintering in the North Sea.

Ongoing coastal seabird surveys will conclude in March 2012 and therefore taken in the overwintering months when Red Throated Divers are most numerous in Northern Irish waters.

Summary of Potential Impacts of Brine Emissions on non-SPA Species recording March – September 2011

With reference to **Appendix C** the possibility that some key prey species of foraging seabirds including commercially exploitable stocks of cod, herring and sprat may avoid the immediate area of the brine diffuser (<10m) cannot be ruled out, but this would only constitute a relatively small population. The immediate vicinity of the brine outfall location is unlikely to support any key population of sandeels, a key component of seabird diets, due to the presence of coarse sediments not favoured by the species. The avoidance of the immediate area of the brine diffuser by prey species is unlikely to result in a significant impact on foraging seabirds, which have currently been recorded within the survey area due to the relatively localised occurrence of avoidance, the extensive foraging ranges of the seabirds in question and the lack of significant seabird foraging behaviour recorded over the discharge location.

Black guillemots have a relatively restricted foraging area (c.5km) but can forage up to much greater distances. The extensive nearshore kelp beds are likely to support butterfish a staple component of black guillemot diets. Foraging black guillemots likely to be associated with the Portmuck and Castle Robin colonies were almost exclusively recorded foraging within 250mm of the coastline, corresponding with the distribution of kelp beds. The eggs and larvae of butterfish are benthic and commonly occur inshore on hard rocky substrates and are therefore unlikely to be present around the immediate vicinity of the brine outfall. Like many blenny species butterfish are euryhaline (Evans, 1969) and able to tolerate a range of salinities, avoidance of immediate area of the brine diffuser cannot be ruled out but would not be expected within the wider mixing area and therefore to result in the loss of a key prey population for nesting black guillemots.

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LEGEND

Survey Area

- Brine Outfall Pipe
- Coastal Seabird Survey Area 2011

Designated Sites

- ASSI

ISSUE DETAILS

Drawn: NR		Project No. NI 1024	
Chkd: JMC		File Ref.	
Appd: RH			
Date: November 2011		Drawing No.	Rev. 01
Scale: N.T.S			

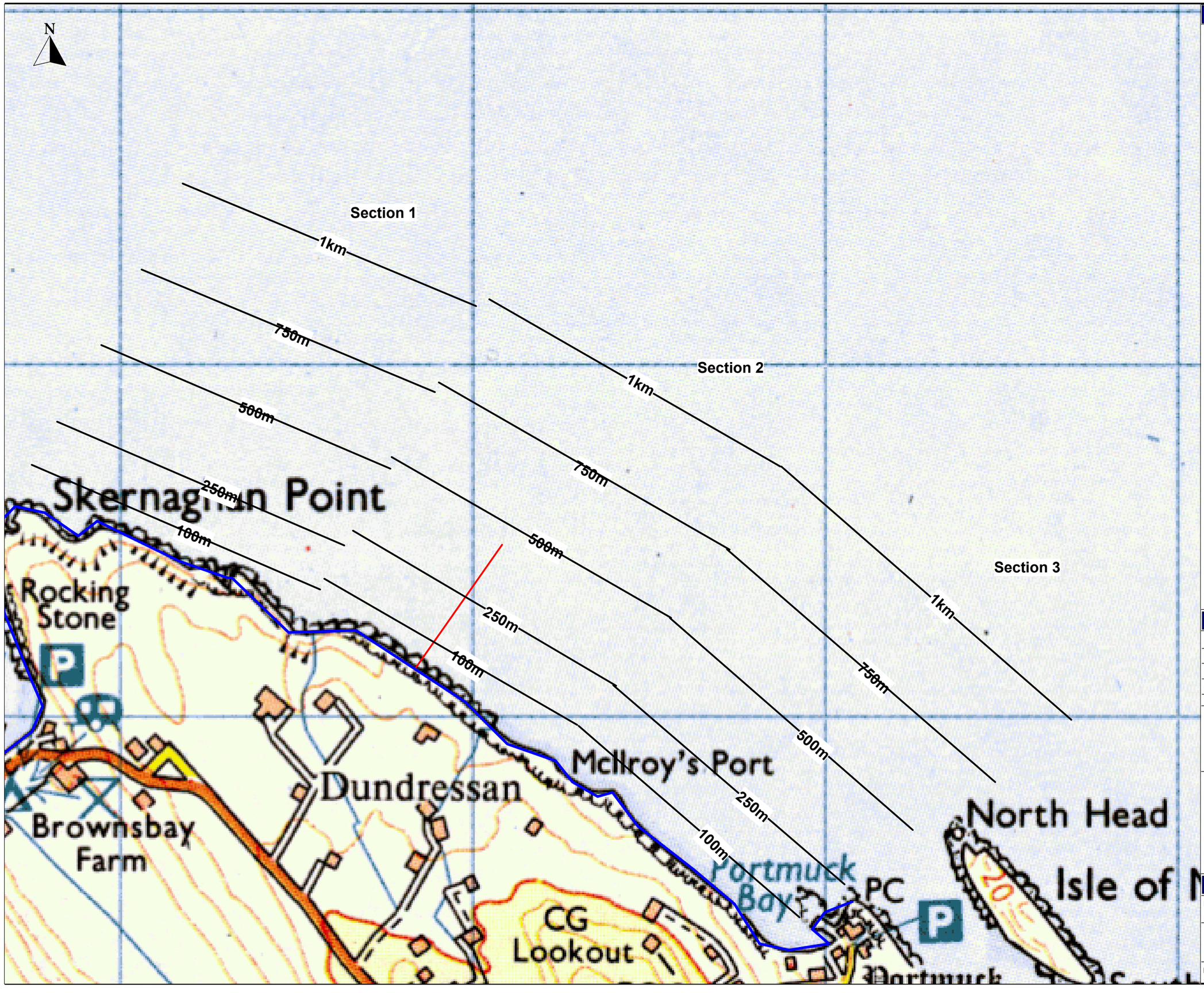
RPS

PROJECT & FIGURE DETAILS

Project Title: Islandmagee Storage Limited

Figure Title: 2011 Coastal Seabird Survey Area

Figure Number: D1



LEGEND

Survey Area

- Brine Outfall Pipe
- Coastal Seabird Survey Area 2011

Survey Sections

- Offshore Distance Bands

ISSUE DETAILS

Drawn: NR	Project No. NI 1024	
Chkd: JMC	File Ref.	
Appd: RH		
Date: November 2011	Drawing No.	Rev. 01
Scale: N.T.S		

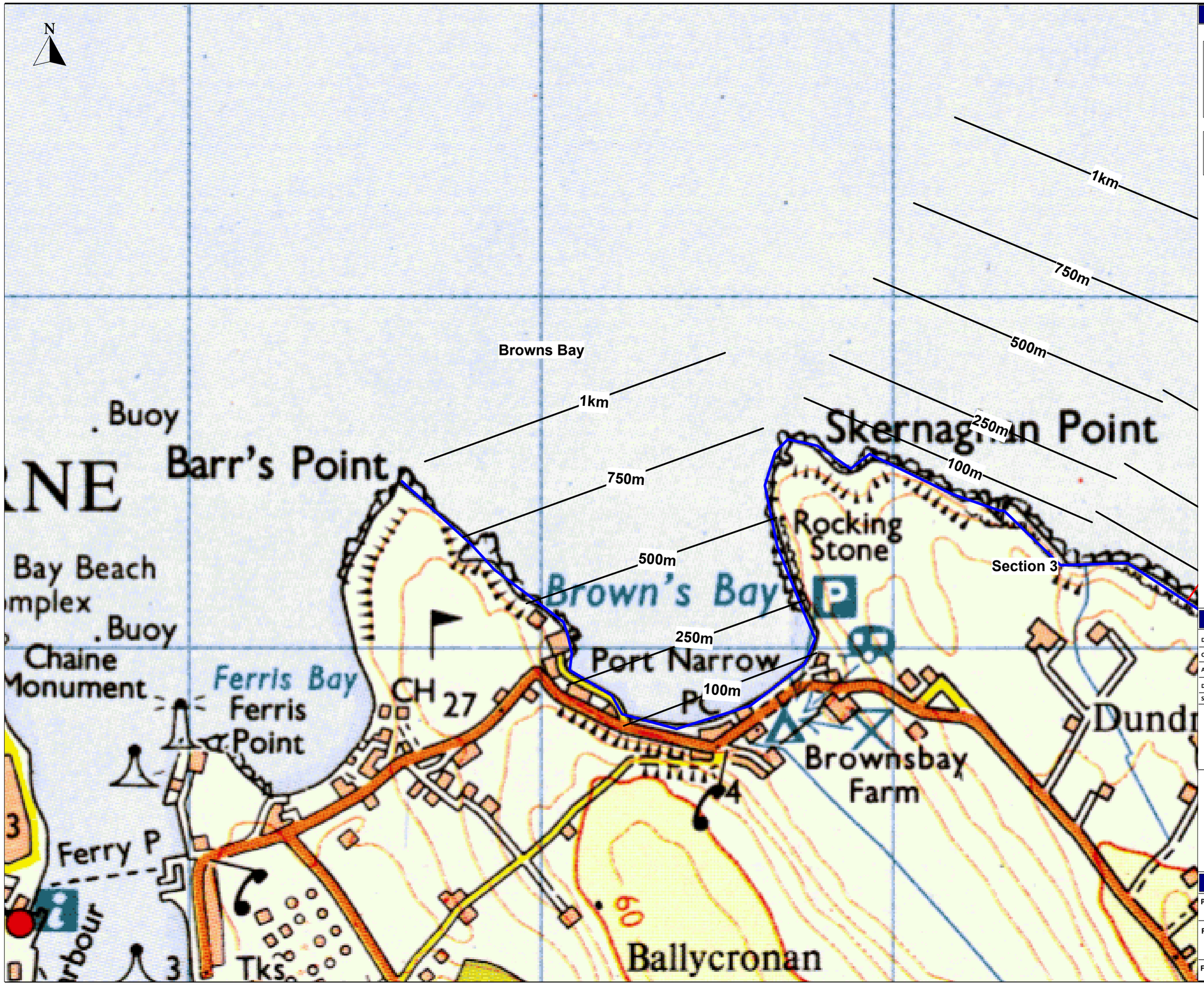
RPS

PROJECT & FIGURE DETAILS

Project Title: Islandmagee Storage Limited

Figure Title: 2011 Coastal Seabird Survey Sections

Figure Number: D2



LEGEND

Survey Area

- Brine Outfall Pipe
- Coastal Seabird Survey Area 2011

Survey Sections

- Offshore Distance Bands

ISSUE DETAILS

Drawn:	NR	Project No.	NI 1024
Chkd:	JMC	File Ref.	
Appd:	RH		
Date:	November 2011	Drawing No.	Rev. 01
Scale:	N.T.S		

RPS

PROJECT & FIGURE DETAILS

Project Title:
Islandmagee Storage Limited

Figure Title:
2011 Coastal Seabird Survey Sections

Figure Number: D3

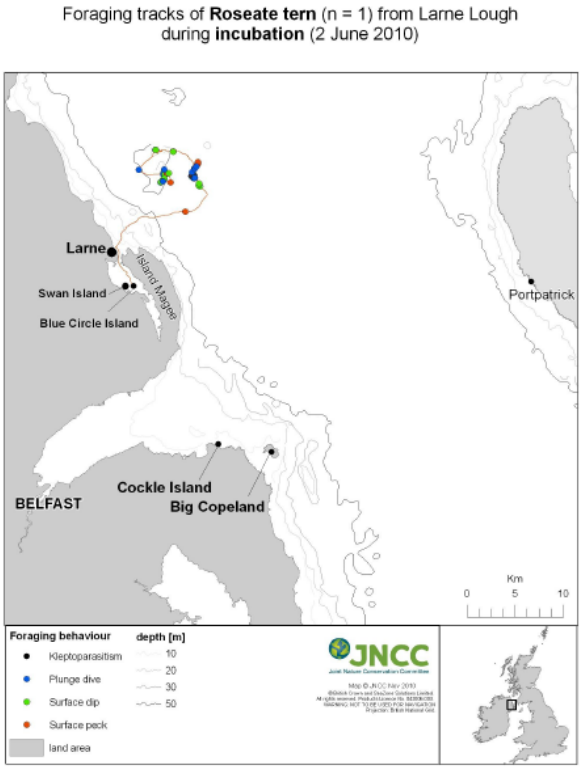


Figure D4 Single Foraging Track of Roseate Tern from Larne Lough during incubation 2010 (Reproduced under permission from JNCC, 2011)

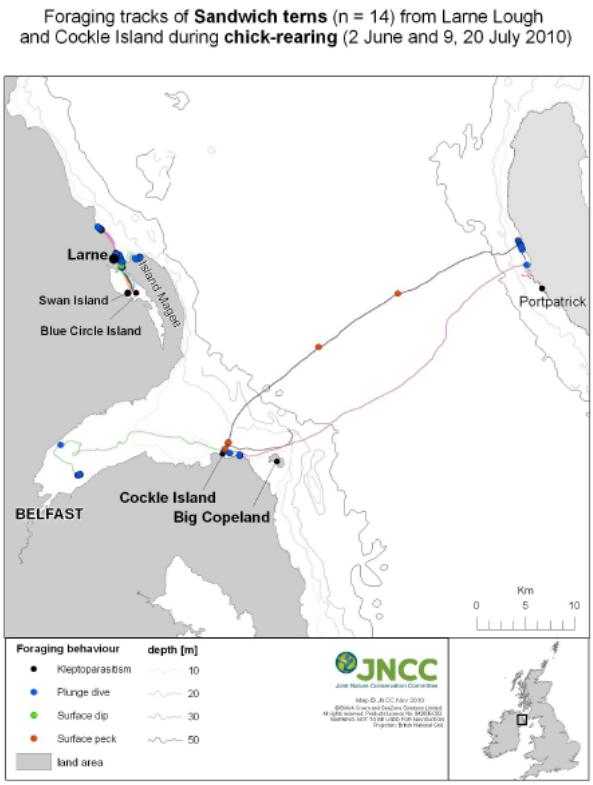


Figure D5 Foraging Tracks of Sandwich Terns from Larne Lough during Chick-rearing 2010 (Reproduced under permission from JNCC 2011)

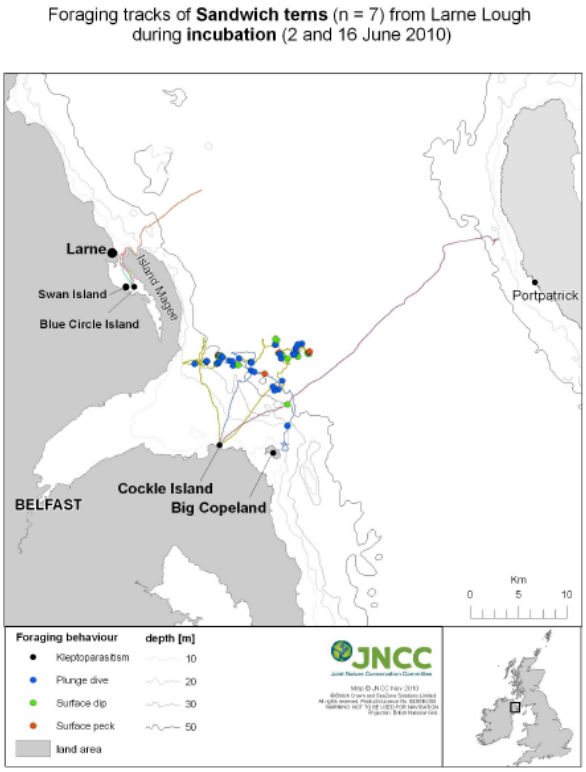


Figure D6 Foraging Tracks of Sandwich Terns from Larne Lough during incubation 2010 (Reproduced under permission from JNCC, 2011)

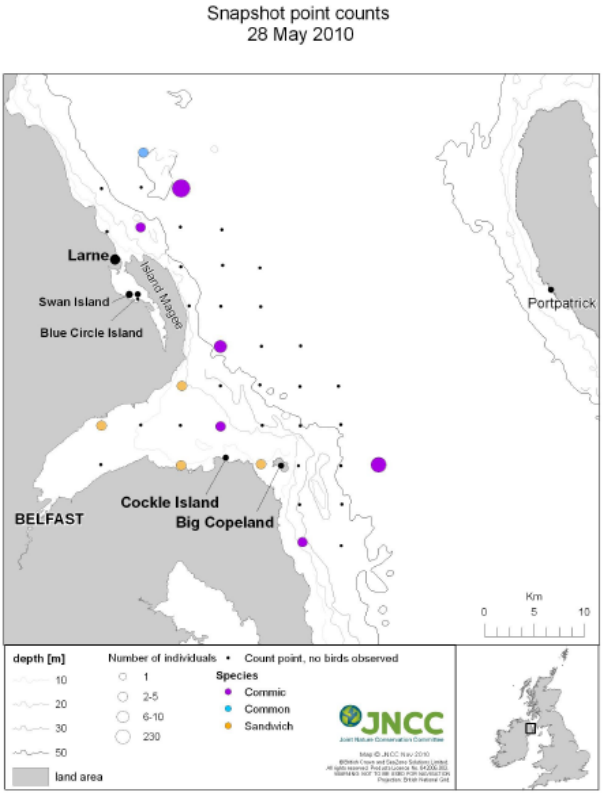


Figure D7 Snapshot Point Counts of Foraging Terns in May 2010 (Reproduced under permission from JNCC, 2011)

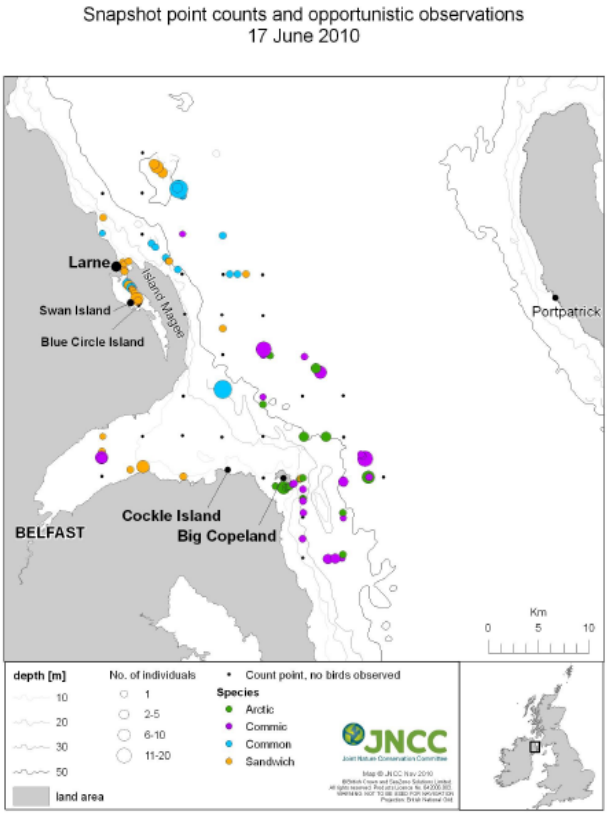


Figure D8 Snapshot Point Counts (and Observations) of Foraging Terns in June 2010 (Reproduced under permission from JNCC, 2011)

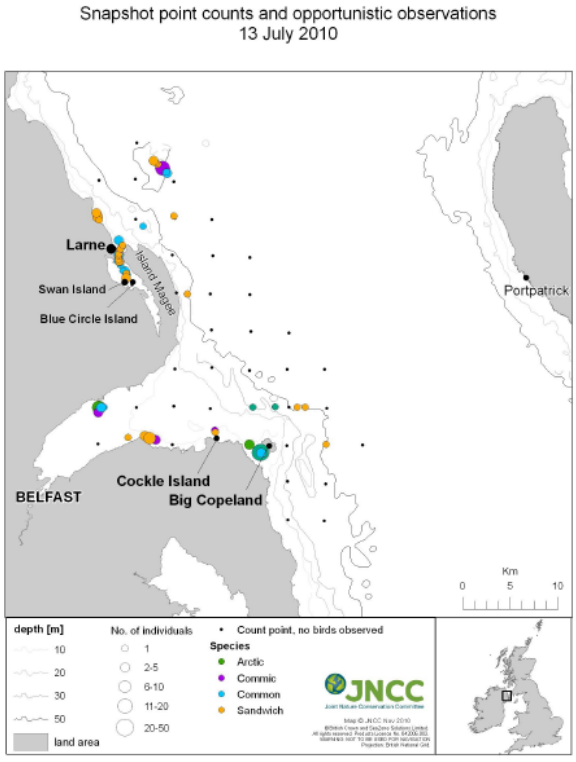


Figure D9 Snapshot Point Counts (and Observations) of Foraging Terns in July 2011 (Reproduced under permission from JNCC, 2011)

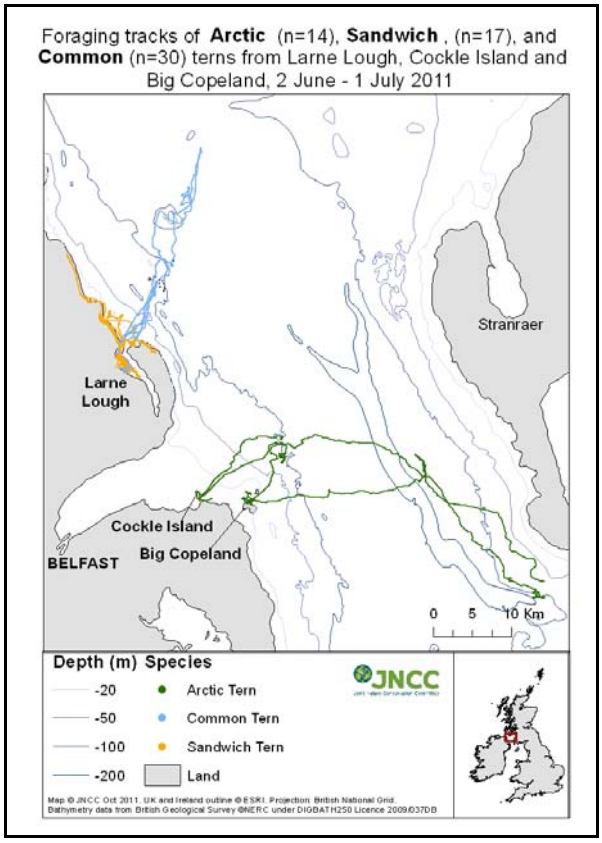
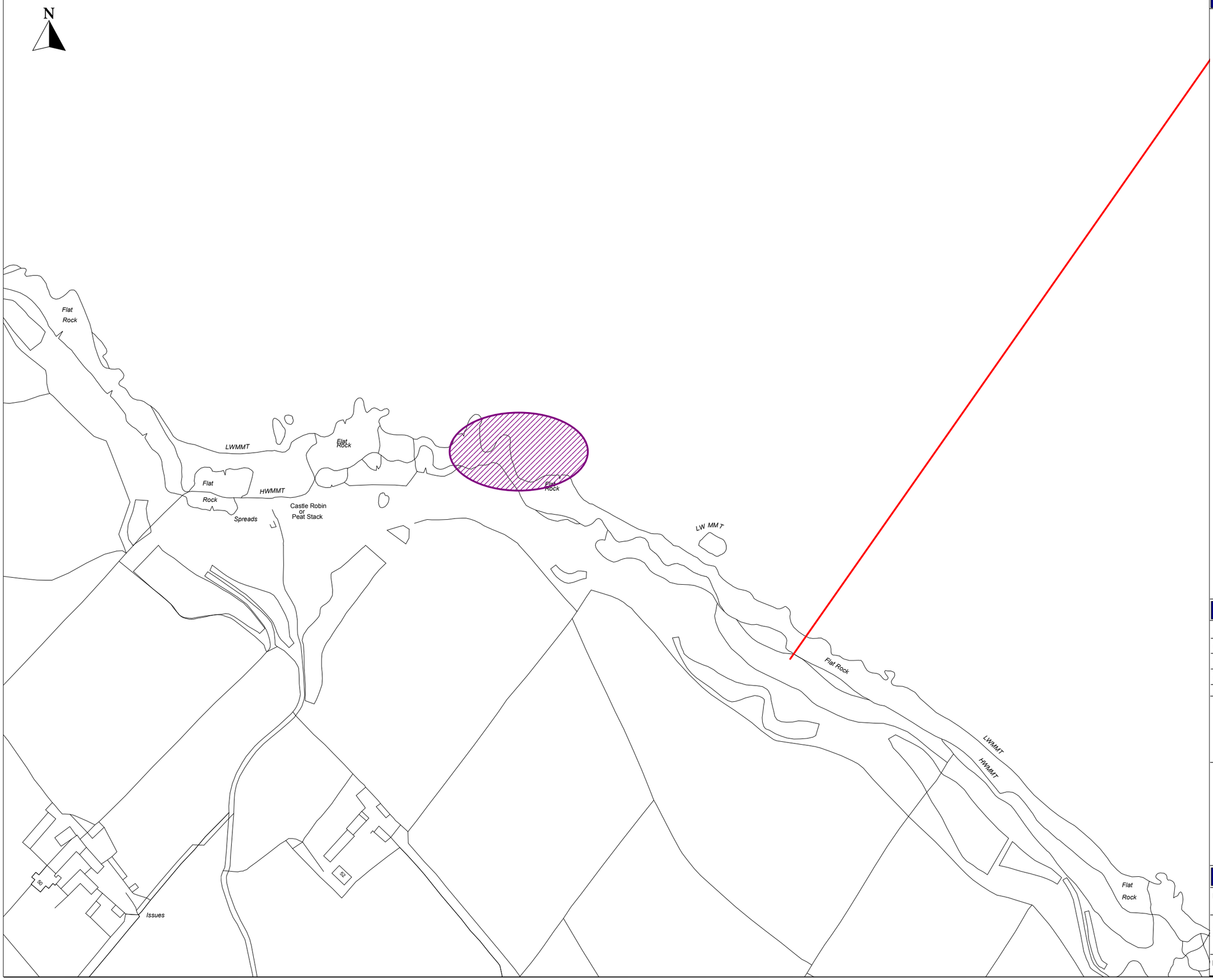


Figure D10 Foraging Tracks of Sandwich Terns followed from Larne Lough June/July 2011 (Reproduced under permission from JNCC, 2011)



LEGEND

Survey Area

Brine Outfall Pipe

Breeding Seabirds

Black Guillemot Nest Sites 2011

ISSUE DETAILS

Drawn:	NR	**Project No.**	NI 1024
Chkd:	JMC	**File Ref.**	
Appd:	RH		
Date:	November 2011	**Drawing No.**	**Rev.** 01
Scale:	N.T.S		

RPS

PROJECT & FIGURE DETAILS

Project Title:
Islandmagee Storage Limited

Figure Title:
Nesting Black Guillemots 2011

Figure Number: **D11**

Appendix D2 – Correspondence

RPS submission of Coastal Seabird Survey methodology for NIEA NH approval

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From: Sophie Gilloway [mailto:Sophie.Gilloway@rpsgroup.com]
Sent: 01 June 2011 12:01
To: eimear.campbell@doeni.gov.uk
Subject: Bird survey information for Islandmagee Gas Storage project (1 of 2)

Eimear,

Further to our correspondence last year, although we have not been formally issued an addendum request yet from Planning Service, we have commenced undertaking bird count/behaviour observation surveys on the eastern shores of Islandmagee to assist with the finalisation of the Appropriate Assessment for the Islandmagee Gas Storage project on the presumption that a request for this information will be included in the addendum request. I have attached a copy of the survey methodology and the record sheets which are being used.

Please find attached a copy of a letter issued today to Planning Service. I am cc-ing it to you, as the planning officer who is managing this case is currently on holidays and it might therefore take a few weeks before he has the opportunity to forward the correspondence to NIEA. We would like to confirm sooner rather than later that the detail of the surveys we are undertaking throughout the summer will be satisfactory for you to complete your Appropriate Assessment.

We very much wish to avoid a situation in which a request for further studies is issued from NIEA following the completion of these surveys and I would be most grateful if you were able to confirm whether you would require any extra information now rather than upon receipt of the results.

As you will see, our ornithologists are undertaking surveys in several sectors along a stretch of approximately 2km on the east coast of Islandmagee. After the first couple of survey visits, we extended the observation area to cover a sector within Brown's Bay as it was noted that sandwich terns were mainly flying over the east coast subsections and were spending more time actually feeding in Browns Bay. Salinities in Brown's Bay will not be affected by the proposed brine discharge.

I have also attached three figures. Two of these figures illustrate the bird count/observation areas superimposed on to the maximum neap tide cycle salinity plots produced for the EIS (figure 9.22 and 9.27 in the EIS). These plots show the peak salinity predicted to be experienced during an entire neap tide cycle (even if it is just for a few seconds) at any given point within the model area.

The neap tide maximum salinity plots represent a "worst case" representation of the areas where the salinity will be increased above background, as the weaker tidal currents during a neap tide (in comparison to a spring tide) will decrease the ability to disperse the brine. The greatest increases in salinity are experienced in the lowest portion of the water column, in the 4 metres closest to the bed, as the brine is denser than ambient seawater and has a tendency to sink. The second figure shows the peak salinity for the next "layer" of the water column, between 4 and 8 metres above the sea bed. As we get closer to the surface the salinities are affected much less (I haven't attached diagrams showing the surface and middle layers but they are shown in the EIS in figs 9.28 and 9.29).

The marine impact assessment chapter of the EIS concludes that increases in salinity of up to 2psu above ambient is unlikely to create any perceptible impacts to the marine species at this location. Fluctuations in salinity of more than 2psu above ambient are likely to begin showing some changes

in species composition and some mortality of benthic and epibenthic species. Species which typically live higher in the water column and are mobile are unlikely to be impacted.

For purposes of modelling, the baseline salinity has been set at 34.2psu (this represents an average of salinity measurements recorded at monthly intervals in this area across a number of years). In reality, the ambient salinity fluctuates seasonally up to around 34.8psu therefore we have also taken into account in the impact assessment the increase in ambient salinity (with the brine discharge operating on top of this baseline fluctuation).

I have therefore included a third figure which shows only the neap tide maximum salinity contours above 35.5psu (i.e those contours showing increases of more than 1.3psu above ambient and which could, therefore exceed 36psu during those times of the year where ambient salinity increases) on top of the Admiralty chart.
You can see in this diagram that the area affected is quite limited, extending only approximately 100 metres from the outfall discharge point. Substantial mortality and species reduction [of bird prey species] is not expected until salinity levels exceed 40psu, which only occurs in a very small area (10 metres) around the outfall discharge point.

As you will be aware, the mitigation included in the EIS includes the real time monitoring of salinities around the discharge to ensure that the level of brine dispersion predicted in the EIS is actually achieved. The new Marine Licensing legislation will also give the NIEA greater powers in enforcing any breaches in the agreed levels.

As you can see, our count/survey sections cover a much greater area than what in reality will be impacted by the proposed brine discharge.

I would appreciate it if you could revert at your earliest convenience if you feel that there is any part of the survey methodology that is not sufficient to cover your requirements for the Appropriate Assessment studies. In addition, if you have any queries about any other aspect of the project or EIS, please do not hesitate to contact me.

Kind regards,

Sophie

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NIEA sole response to Coastal Seabird Survey methodology

From: Campbell, Eimear [mailto:Eimear.Campbell@doeni.gov.uk]
Sent: 13 June 2011 16:09
To: Sophie Gilloway
Subject: RE: Bird survey information for Islandmagee Gas Storage project (2 of 2).

Hi Sophie,

Initial thoughts from conservation science are that you are leaving yourselves open to challenge by stopping recording at 700m.
There should be an additional band of recording for this distance and beyond. They would strongly encourage you to get records on this > 700m band.

Eimear

Eimear Campbell - Scientific Officer
Conservation Designations and Protection
Natural Heritage - NIEA
Klondyke Building, Cromac Avenue, Gasworks Buisness Park, Lower Ormeau Road, BELFAST BT7 2JA
Tel - 02890569565